

Amendments to the Claims

This listing of claims will replace all prior listings of claims in the application.

Listing of Claims

Claims 1-33 (cancelled)

34. (Previously presented) A surgical irrigation system, comprising:

a hand held handpiece having an irrigation liquid inlet, and a forward protruding, irrigation liquid supplying tip opposable to a surgical site, and a hand actuatable, irrigation liquid flow control operatively interposed between said inlet and tip;

a liquid supply unit located remotely from said handpiece; and

an elongate, irrigation liquid supply tube connecting said liquid supply unit to said handpiece irrigation liquid inlet.

35. (Previously presented) The apparatus of Claim 34 in which said liquid supply unit comprises a self-contained pumping unit locatable adjacent a source of irrigation liquid and remote from said handpiece, said pumping unit comprising a housing containing an irrigation liquid receiving member, and an irrigation liquid outlet, and an irrigation liquid pumping member operatively interposed between said receiving member and said outlet, a motor drivingly connected to said pumping member, an electric battery, and a hand actuatable, motor control switch connected in circuit with said motor and battery and actuatable for turning on said motor.

36. (Previously presented) The apparatus of Claim 35 in which said hand actuatable control on said handpiece

comprises a hand actuatable member, a valve operatively connected to and responsive to said hand actuatable member for opening, said valve being interposed in an irrigation liquid path in said handpiece from said inlet to said tip, said control member being operatively connected to said switch, said valve having an at least partially open condition corresponding to said motor being energized by said battery.

37. (Currently amended) A surgical irrigation system, comprising:

a handpiece locatable adjacent a surgical site and comprising an irrigation liquid inlet and an irrigation liquid outlet;

a motor/pump unit locatable remote from said handpiece and comprising (1) a motor having a shaft and (2) a housing including a receptacle having an end opening, a cover, and a motor receiving member axially opposing said receptacle and cover;

said motor receiving member comprising an end wall and a hollow tubular wall extending from said end wall and defining a recess, said end wall having a hole therethrough, said motor being received in said recess with said shaft extending through said hole in said end wall, said motor receiving member being interposed between said receptacle and cover;

said cover comprising the open ended dome having a roof and a peripheral wall extending from said roof, said motor receiving member being received in said dome, an annular seal ring radially interposed between said motor receiving member and a surrounding portion of said peripheral wall of said dome, said motor receiving member being axially spaced from said roof of said dome by a pumping chamber, an impeller fixed on said shaft about said motor receiving member and disposed in said pumping chamber, said pumping chamber having an irrigation liquid inlet and an irrigation liquid outlet;

an elongate irrigation liquid path connecting said irrigation liquid outlet of said motor/pump unit to said irrigation liquid inlet of said handpiece.

38. (Previously presented) The apparatus of Claim 37 in which said receptacle is circular.

39. (Previously presented) The apparatus of Claim 37 in which said receptacle has a side wall and an end wall, said cover having a flange extending radially outboard of said peripheral wall thereof substantially to said side wall of said receptacle.

40. (Previously presented) The apparatus of Claim 39 in which said motor receiving member has a flange extending radially outboard and axially interposed between said flange of said cover and the top edge of said side wall of said receptacle member.

41. (Previously presented) The apparatus of Claim 39 in which said flange of said cover includes a generally L-profile tab extending from a radially outer portion of said flange and having a radially extending lip, fixing structure fixing said cover with respect to said receptacle and said motor receiving member, said fixing structure including said tab.

42. (Previously presented) The apparatus of Claim 41 in which said motor receiving member has a flange extending radially outboard, said tab extending through an opening in said flange of said motor receiving member.

43. (Previously presented) The apparatus of Claim 37 in which said receptacle has a side wall and an end wall, said

motor having an end facing a central portion of said end wall of said receptacle, said receptacle having a battery receiving zone surrounding said central portion and within said side wall and including side-by-side, axially elongate, battery receiving spaces.

44. (Previously presented) The apparatus of Claim 43 in which said receptacle defines a cup and at least a portion of said motor extends into said cup.

45. (Previously presented) The apparatus of Claim 37 in which said receptacle has a central portion and a side wall, said housing including generally circumferentially distributed, battery separator elements disposed along and extending between said central portion and side wall of said receptacle, said separator elements having radially inboard and outboard portions which extend in a generally circumferential direction sufficient to block radial inward and outward battery displacement in said receptacle.

46. (Previously presented) The apparatus of Claim 45 in which said separator elements are fixed to and radially extend from said hollow tubular wall of said motor receiving member.

47. (Previously presented) The apparatus of Claim 48 in which said housing includes generally circumferentially distributed battery separator elements, first and second sets of electrically conductive battery contacts, said first set comprising at least one electrically conductive spring wire contact which comprises a bight connecting a pair of spring portions having a battery engaging surface, said spring portions being laterally located by said battery separating elements, said second set comprising conductive, generally

plate-like contacts of which at least one comprises a pair of spaced disks connected by a strip and another comprises separate terminals in circuit with said motor.

48. (Previously presented) The apparatus of Claim 47 in which said receptacle has a side wall and a bottom wall, said motor receiving member further comprising a deck radially outwardly extending from said hollow tubular wall, said battery separating elements extending radially outboard from said hollow tubular wall and extending axially from said deck and defining battery receiving grooves therebetween, said spring portions of a given said contact being disposed in adjacent ones of said grooves with the corresponding said bight spanning the intervening separating element and the bases of said spring portions being adjacent said deck, said disks being respectively fixedly located coaxially with adjacent ones of said grooves but lying fixedly adjacent said end wall of said receptacle.

49. (Previously presented) A surgical irrigation system, comprising:

- a hand held handpiece having an irrigation liquid inlet and outlet;

- a self-contained pumping unit locatable adjacent a source of irrigation liquid and remote from said handpiece, said pumping unit comprising a housing containing an irrigation liquid inlet, an irrigation liquid outlet, an irrigation liquid pumping member opposing said outlet, a motor having a shaft drivingly coupled to said pumping member, and an electric battery circuit connected with said motor;

- an elongate, irrigation liquid supply tube connecting said pumping unit outlet to said handpiece inlet, said pumping unit housing comprising a cup having an end wall and an opposed open end, a generally radially extending deck

overlying the open end of the cup, and a cover overlying said deck;

battery locating elements in said cup and circumferentially spaced by generally axially extending battery receiving spaces surrounding an open central space in said cup for locating a circumferential array of batteries in said cup;

electric contacts aligned with said battery receiving spaces adjacent opposite ends of said battery receiving spaces, said electric contact of one said battery receiving space electrically connecting to a corresponding said electric contact in the next said battery receiving space for electrically connecting batteries, said electric contacts being located between said deck and the end wall of said cup, said circuit including said contacts.

50. (Previously presented) The apparatus of Claim 49 including an impeller between said deck and said cover and fixed for rotation with said motor shaft, said cover having an outboard end wall and a side wall and containing a pumping chamber located above said deck, said liquid inlet being at said end wall of said cover for connection to a conventional irrigation liquid supply, said irrigation liquid outlet opening through said side wall of said cover.

51. (Previously presented) The apparatus of Claim 49 in which said deck has circumferentially spaced areas along the periphery thereof, said cover having circumferentially spaced, snap fit tabs, said deck being sandwiched between said cup and cover.

52. (Previously presented) The apparatus of Claim 49 including a substantially cylindrical plug coaxial with said motor shaft and through which said motor shaft extends into

said pumping chamber, said cover having a dome and including said outboard end wall and side wall and forming said pumping chamber, said dome extending inboard from said pumping chamber and closely and sealingly receiving said plug, said cover having a radially outward flange closely overlying said deck and from which said dome is upstanding.

53. (Currently amended) The apparatus of Claim 49 in which a column coaxially depends from said deck into said cup, said column having a central recess receiving said motor, said motor shaft protruding up through a hole in said deck and facing into a pumping chamber ~~extending~~ lying between said deck and said cover, said pumping member being in said pumping chamber and fixed on said motor shaft for rotation therewith;

generally axially extending, radially outward reaching, battery locating fins on said column and circumferentially spaced by generally axially extending battery receiving grooves.

54. (Currently amended) A surgical irrigator system, comprising:

a handpiece ~~for applying~~ having an irrigation liquid outlet opposable to a surgical site;

a motor/pump unit comprising a pumping chamber having a floor, a roof spaced above said floor and a peripheral wall generally upstanding between said floor and roof, said pumping chamber having a shaft extending substantially coaxially into said pumping chamber through said floor and toward said roof, an impeller fixed for rotation with said shaft, said pumping chamber having a liquid inlet substantially coaxial with said shaft and opening into said pumping chamber through said roof, said pumping chamber having a liquid outlet extending substantially tangentially through

said peripheral wall, and an electrical motive power source rotatably driving said shaft;

a liquid path connecting said outlet and handpiece;

a pole-engageable, motor/pump unit support member extending from said motor/pump unit and adapted to support said motor/pump unit on an irrigation liquid container support pole;

a generally tubular, elongate, liquid receiving member extending from said roof adjacent said inlet and having a remote free end portion including an irrigation liquid container connection structure.

55. (Previously presented) The apparatus of Claim 54, including an upstanding pole having an irrigation liquid container support fixed on said pole, said motor/pump unit support member fixedly locating said motor/pump unit adjacent said irrigation liquid container support.

56. (Previously presented) The apparatus of Claim 55 including an irrigation liquid container having an irrigation liquid outlet, said irrigation liquid container being supported by said irrigation liquid container support.

57. (Previously presented) The apparatus of Claim 56, in which said irrigation liquid container is a bag fixed on said irrigation liquid container support.

58. (Previously presented) The apparatus of Claim 54 in which said generally tubular, elongate, liquid receiving member comprises an outlet portion formed as an upstanding extension of said roof and having a liquid outlet end open to said pumping chamber, said generally tubular, elongate, liquid receiving member comprising an inlet portion including said



irrigation liquid container connection structure, and a passage connecting said inlet and outlet portions.

59. (Previously presented) The apparatus of Claim 54 in which said generally tubular, elongate, liquid receiving member comprises an outlet portion open to said pumping chamber, and further comprises an inlet portion including said irrigation liquid container connection structure, and a passage connecting said inlet and outlet portions, said inlet portion being of hollow tubular shape with an outer periphery generally tapered toward its inlet end and a releasably fixing surface treatment to releasably fix in an outlet of an irrigation liquid container.

60. (Previously presented) The apparatus of Claim 59, in which said surface treatment is a radial protrusion engagable with an irrigation liquid supply container outlet.

61. (Previously presented) The apparatus of Claim 54 in which said liquid receiving member comprises a hollow, tubular spike integral with said roof and having said inlet and outlet portions adjacent opposite ends thereof.

62. (Previously presented) The apparatus of Claim 54 in which said motor/pump unit further comprises a cup-like battery receiver fixed under said pumping chamber, said pole-engaging, motor/pump unit support member extending from said battery receiver.

63. (Previously presented) A surgical irrigation system, comprising:

a handpiece for directing irrigation liquid to a surgical site, said handpiece having a manually actuatable member having liquid flow blocking and liquid flow permitting positions;

a pumping unit locatable remotely from said handpiece, an elongate irrigation liquid tube connecting said pumping unit to said handpiece for delivery of irrigation liquid from said pumping unit to said handpiece, said pumping unit including a pumping chamber having an outlet connected to said irrigation liquid tube, said pumping chamber having an inlet, a tubular protrusion coupled to and upstanding from said inlet for receiving irrigation liquid, said tubular protrusion having an open, liquid receiving, free end spaced from said pumping chamber, a liquid pumping member in said pumping chamber adjacent said tubular protrusion, a motor drivingly coupled to said liquid pumping member, said motor having an energized condition corresponding to at least one said flow permitting position of said manually actuatable member of said handpiece.

64. (Previously amended) The apparatus of Claim 63 in which said tubular protrusion open end faces at an acute angle to a longitudinal axis of said tubular protrusion.

65. (Previously presented) The apparatus of Claim 63 in which said tubular protrusion has an outboard portion spaced from said pumping chamber and having a relatively gradual taper away from said pumping chamber, said tubular protrusion having an inboard portion flared radially outward adjacent said pumping chamber at a relatively greater taper which decreases toward said outer portion.

66. (Currently amended) A surgical irrigation system connectable to a conventional independent irrigation liquid supply container, said system comprising:

a handpiece for directing irrigation liquid to a surgical site;

a compact pumping unit locatable remotely from the handpiece and surgical site, an elongate irrigation liquid

tube connecting said pumping unit to said handpiece for delivery of pumped irrigation liquid from said pumping unit to said handpiece, said pumping unit comprising a motor having a power source connector, a pumping member drivingly coupled to said motor and coupled in irrigation liquid pumping relation with said elongate tube and through said elongate tube to said handpiece, a cover enclosing a pumping chamber occupied by said pumping member and having an irrigation liquid outlet connected to said elongate tube, said cover further including an irrigation liquid inlet opening, a tubular liquid transfer member protruding from said cover, said tubular liquid transfer member having an outer, sealing surface configured for sealed insertion into an outlet fitting of an independent conventional irrigation liquid supply container, said tubular liquid transfer member being formed as an elongate hollow tube having a generally central, irrigation liquid bore extending substantially the length of said tube, said bore having an upper end open to receive irrigation liquid from a liquid supply container, said bore having a lower end open at and to said cover irrigation liquid inlet opening in irrigation liquid directing relation into said pumping chamber, whereby insertion of said tube into the inlet fitting of a conventional irrigation liquid supply container—~~simultaneously~~ causes the outside of the tube to sealingly engage the pumping unit—~~therewith~~ and enables said bore to supply liquid to said pumping chamber.

67. (Previously presented) The apparatus of Claim 66 in which a distal portion of said tube is tapered and includes a peripheral surface adapted to capture by a liquid outlet fitting of an irrigation liquid supply container.

68. (Previously presented) The apparatus of Claim 67 wherein said tube is a hollow spike upstanding from said cover.

69. (Previously presented) The apparatus of Claim 66 in which said pumping unit includes a cup-like battery receiver fixed below said pumping chamber.

70. (Previously presented) The apparatus of Claim 69 in which said receiver comprises a top-opening cup having upstanding, circumferentially distributed battery stations surrounding a central zone, said pumping unit including conductors electrically connecting said battery stations in circuit with said motor to drive said pumping member.

71. (Previously presented) A surgical irrigator system, comprising:

- a handpiece for applying irrigation liquid to a surgical site;

- a motor/pump unit comprising a pumping chamber having a floor, a roof spaced above said floor and a peripheral wall generally upstanding between said floor and roof, said pumping chamber having a liquid inlet substantially coaxial with and opening into said pumping chamber through said roof, said pumping chamber having a pumped liquid outlet extending substantially tangentially through said peripheral wall;

- said motor/pump unit also having an impeller in said pumping chamber, said impeller comprising a disk-like base fixed on a shaft and having a raised central portion substantially coaxial with and raised toward said inlet, said impeller further comprising plural circumferentially spaced fluid pumping blades upstanding from said base, said blades being curved and extending generally in a radial direction away from the rotational axis of said impeller and said raised

central portion of said base, said blades extending in an axial direction toward said roof and inlet, a given said blade including an upstanding radially outer edge which faces the perimeter of said pumping chamber, said given blade having a top edge opposing said roof and substantially parallel to a portion of said base, said given blade having an upstanding first side which is convexly curved and extends away from said rotational axis to said outer edge and is positionable during rotation of said impeller to face toward said outlet.

72. (Previously presented) The apparatus of Claim 71 in which said given blade has a concavely curved second side facing away from said first side, said radially outer edge of said given blade being circumferentially offset with respect to a radially inner portion of said given blade.

73. (Previously presented) The apparatus of Claim 71 in which said impeller is spaced from said floor, roof and perimeter wall of said pumping chamber.